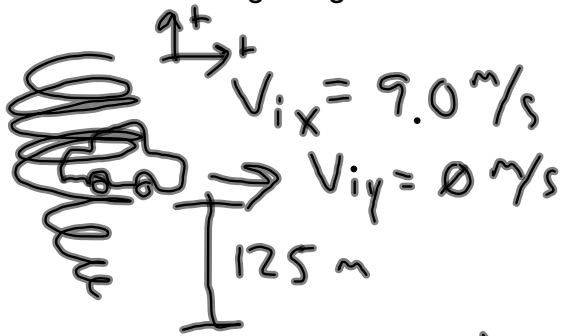


# Projectile Motion Practice Problems 1st Block 9.9.11

During a thunderstorm, a tornado lifts a car to a height of 125 m above the ground. Increasing in strength, the tornado flings the car horizontally with a speed of 9.0 m/s. How long does the car take to reach the ground? How far horizontally does the car travel before hitting the ground?



$$\Delta y = \cancel{V_{iy}t} + \frac{1}{2}a_y t^2$$

$$t = \sqrt{\frac{2\Delta y}{a_y}}$$

$$= 5.05 \text{ s}$$

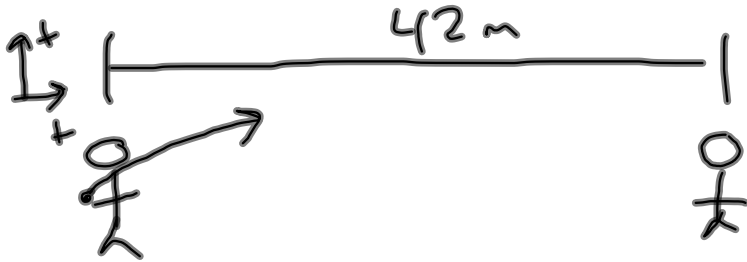
$$\Delta x = V_{ix}t + \cancel{\frac{1}{2}a_x t^2}$$

$$= (9.0 \text{ m/s})(5.05 \text{ s})$$

$$= 45.5 \text{ m}$$

## Projectile Motion Practice Problems 1st Block 9.9.11

A baseball is thrown at an angle of 25 degrees relative to the ground at a speed of 23.0 m/s. If the ball was caught 42.0 m from the thrower at the same height it was thrown, how long was it in the air? How high above the thrower did the ball travel?



A velocity vector diagram for the initial velocity  $\vec{v}_i$ . The vector is shown at an angle of 25 degrees to the horizontal component  $\vec{v}_{ix}$ . The vertical component is labeled  $\vec{v}_{iy}$ .

$$\Delta x = 42 \text{ m}$$
$$v_{ix} = 20.85 \text{ m/s}$$
$$v_{iy} = 9.72 \text{ m/s}$$

$$\Delta x = v_{ix} t$$

$$t = \frac{\Delta x}{v_{ix}} = \frac{42.0 \text{ m}}{20.85 \text{ m/s}} = 2.01 \text{ s}$$

$$v_{fy} = 0 \text{ m/s @ highest point}$$

$$v_{fy}^2 = v_{iy}^2 + 2a_y \Delta y$$

$$\Delta y = \frac{-v_{iy}^2}{2a_y} = \frac{-(9.72 \text{ m/s})^2}{2(-9.8 \text{ m/s}^2)} = 4.82 \text{ m}$$